

A New Species of *Rhaphiolepis* (Rosaceae) from Hainan Island, China

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ABSTRACT. *Rhaphiolepis wuzhishanensis* W. B. Liao, R. H. Miao & Q. Fan (Rosaceae) is described as a new species from Mt. Wuzhishan of Hainan Island in China. The new species is most similar to *R. umbellata* (Thunberg) Makino in morphology, but differs in having more flowers (70 to 100) in the inflorescence, more stamens (ca. 25), styles connate to the midpoint, smaller fruits (5–7 mm diam.), and a longer, densely rusty tomentum. The ecological and conservation status of the new species is also assessed.

Key words: China, Hainan Island, IUCN Red List, *Rhaphiolepis*, Rosaceae.

Hainan Island is located in southern China and known as a part of the Indo-Burma biodiversity hotspot, with some 4094 indigenous vascular plant species in an area of 33,900 km<sup>2</sup> (Myers et al., 2000; Liao et al., 2002, 2003). Since 1999, we have conducted extensive botanical surveys on Hainan Island in order to elucidate the composition and biodiversity of the local rainforests and the zonal differentiation of typical floristic elements of southern China (Liao et al., 2001; Tang et al., 2002). During this investigation, the new species *Rhaphiolepis wuzhishanensis* W. B. Liao, R. H. Miao & Q. Fan was collected in Mt. Wuzhishan, the highest mountain on Hainan Island, with an altitude of 1867 m.

The genus *Rhaphiolepis* Lindley comprises nine species, distributed in eastern and southeastern Asia (Robertson, 1991). Four species were recorded previously in Hainan Island, i.e., *R. indica* (L.) Lindley, *R. lanceolata* H. H. Hu, *R. ferruginea* F. P. Metcalf (Kuau & Yu, 1974; Lu et al., 2003), and *R. salicifolia* Lindley (Chen, 2000). Compared with those species, the new species we collected shows some obvious differences, and further studies indicate that the new species is morphologically similar to *R. umbellata* (Thunberg) Makino. To distinguish *Rhaphiolepis* species in Hainan Island, a revised identification key is provided (based on Chun, 1965; Lu et al., 2003).

A REVISED KEY TO RHAPHIOLEPIS SPECIES IN HAINAN ISLAND, CHINA

1a. Leaves abaxially, petiole, and pedicel densely rusty tomentose.

- 2a. Leaf margin entire, blade abaxially densely rusty tomentose, not glabrescent; stamens 15; styles connate only at the base . . . . *R. ferruginea*
- 2b. Leaf margin coarsely serrate apically, blade abaxially densely rusty tomentose when young, soon glabrescent; stamens (22 to)25(to 30); styles connate to the midpoint . . . . .*R. wuzhishanensis*
- 1b. Leaves, petiole, and pedicel glabrous or only abaxially slightly tomentose or pubescent.
- 3a. Stamens 15, as long as, shorter, or longer than petals.
- 4a. Leaf blade ovate or oblong, rarely obovate or oblong-lanceolate, 2–8 × 1.5–4 cm . . . . .*R. indica*
- 4b. Leaf blade narrowly lanceolate, 3–9.5 × 0.5–1.4 cm . . . . .*R. lanceolata*
- 3b. Stamens 20, shorter than petals . . . .*R. salicifolia*

**Rhaphiolepis wuzhishanensis** W. B. Liao, R. H. Miao & Q. Fan, sp. nov. TYPE: China. Hainan Island: Mt. Wuzhishan, near summit, 1830 m, 18°53'820"N, 109°42'103"E, 5 Aug. 2005, Q. Fan 6087 (holotype, SYS; isotype, MO). Figure 1.

Species nova *Rhaphiolepidi umbellato* (Thunberg) Makino similis, sed floribus pluribus et densioribus, staminibus (22 ad)25(ad 30) (non 15 ad 20), stylis ad partem media non solum ad basim connatis, fructibus minoribus differt.

Evergreen shrub or small tree, 2–4 m high, much branched; branchlets terete, densely rusty tomentose when young, later glabrescent, older branches stout, black or dark black. Leaves crowded at tips of branchlets; petiole 0.5–1.1 cm, narrowly decurrent-alate; stipules subulate, 2–3 mm; leaf blades elliptic-ovate or elliptic, 3–6 × 1.8–3 cm, thickly coriaceous, adaxially white tomentose, denser along midrib and secondary venation, abaxially densely rusty tomentose when young, soon glabrescent, tomentum 1.5–1.7 mm, midrib elevated on both surfaces, secondary venation camptodromous, 8 to 11 veins on each side of midrib, slightly impressed adaxially, margin coarsely serrate apically, distinctly revolute, apex obtuse to slightly acute, base cuneate-decurrent. Inflorescences in terminal panicles, 70- to 100-flowered, 7–10 cm long, 6–7.5 cm diam.; peduncle and pedicels densely



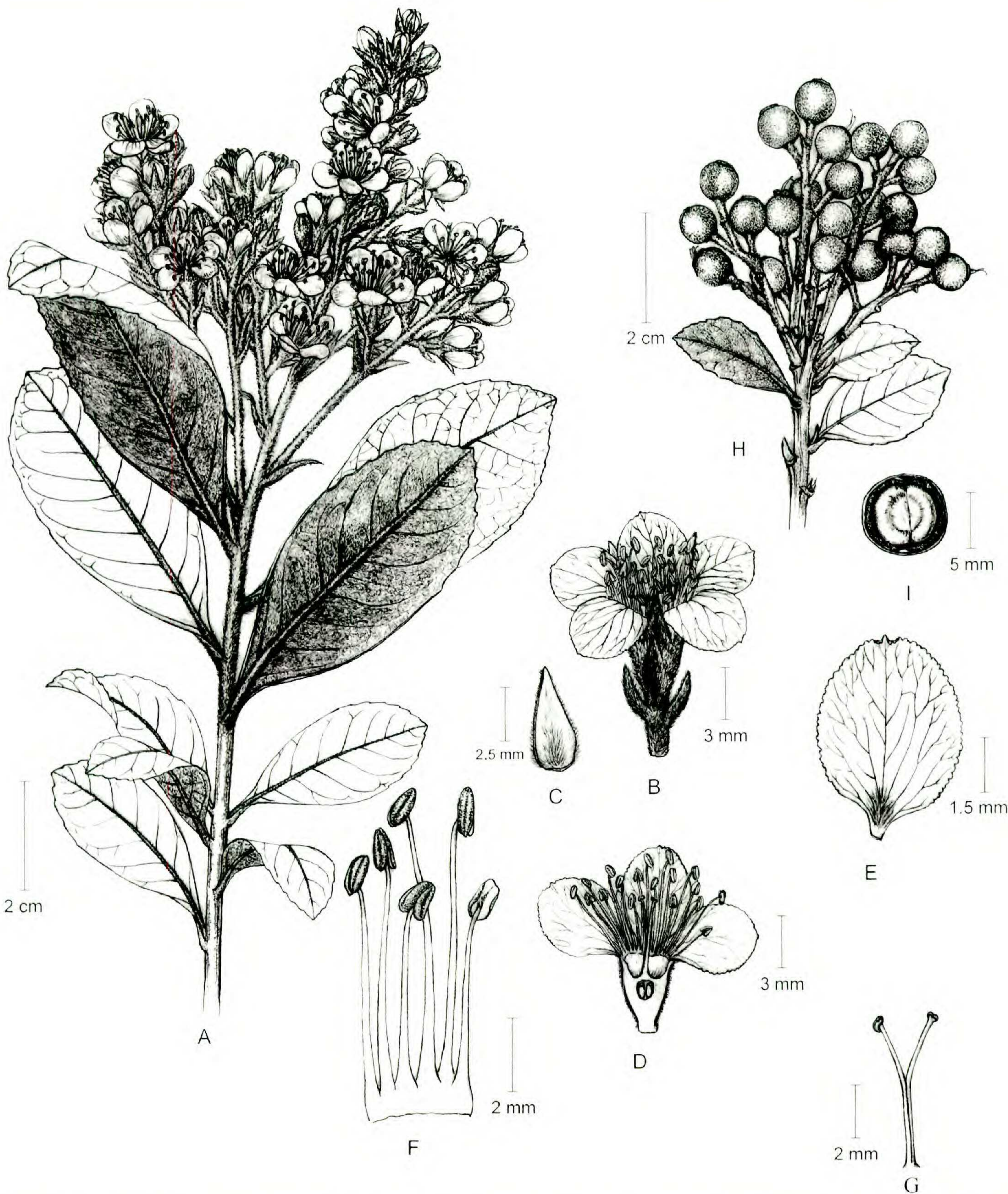


Figure 1. *Rhaphiolepis wuzhishanensis* W. B. Liao, R. H. Miao & Q. Fan —A. Flowering branch. —B. Flower with calyx and bracts. —C. Calyx lobes, adaxial view. —D. Flower, in longitudinal section. —E. Petal. —F. Stamens. —G. Style. —H. Fruit branch. —I. Fruit, in longitudinal section. A–G from *Q. Fan 6087* (holotype, SYS); H, I from *Q. Fan 6085* (paratype, MO). Drawn by Yunxiao Liu.

rusty tomentose; bracts and bractlets narrowly ovate-triangular or lanceolate, 4–6 mm, both surfaces rusty tomentose. Flowers 8–10 mm diam. Hypanthium campanulate, ca. 5 × 5 mm, abaxially densely rusty tomentose, 5-lobed, the calyx lobes lanceolate, 3–5 × 1.5–2 mm, rusty tomentose on both surfaces; petals white, obovate-spatulate or rotund, 6–8 ×

4–7 mm, slightly pubescent basally, margin irregularly crenulate, apex obtuse and mucronulate; stamens (22 to)25(to 30), 4–9 mm, alternately unequal in length, the longer ones as long as or slightly longer than the petals; ovary ovoid, 1.5–2 mm, 2-loculed, with 2 ovules per locule; styles 2(to 3), glabrous, connate from base to middle;



ovules ovoid, ca. 0.8 mm. Pome black at maturity, globose, 5–7 mm diam., glabrous.

*Phenology.* Flowering in January, July, and August; fruiting in August.

*Distribution and habitat.* Currently known only from Mt. Wuzhishan on Hainan Island, China, in mountain forests, on cliffs, or at summits at altitudes from 1600 to 1860 m.

*Systematic relationships.* The most typical characters of *Rhaphiolepis wuzhishanensis* are the stamen number of (22 to)25(to 30) and the style that is connate from base to middle; these characters distinguish the taxon from all the other species of *Rhaphiolepis*, which have 15 to 20 stamens and a style connate only at base. Based only on the number of stamens and the densely rusty tomentum below the leaves, the species might be mistaken as *Eriobotrya* Lindley. However, there are no persistent sepals on the mature fruits of *R. wuzhishanensis*. Moreover, the new species is a much-branched shrub or small tree no more than 4 m high, with leaves with curved lateral veins, a glabrous style, and a 2-loculed ovary. On this basis, the new species is treated as *Rhaphiolepis*. In fact, with sterile specimens, the new species is readily distinguished from the other four species in Hainan Island (i.e., *R. indica*, *R. salicifolia*, *R. lanceolata*, and *R. ferruginea*) by its densely rusty tomentum on young branchlets and the abaxial leaf surfaces. Furthermore, the new species is the only *Rhaphiolepis* occurring above 1600 m on Hainan Island.

The closest relative of *Rhaphiolepis wuzhishanensis* on morphological grounds could be *R. umbellata*. They share many similar characters, e.g., habit, the revolute leaves at the top of branchlets, the elliptic-ovate or elliptic leaf blades, and inflorescences with rusty tomentum. *Rhaphiolepis wuzhishanensis* can be readily separated from *R. umbellata*, however, by its greater number of stamens (on average 25 vs. 20), the styles connate to the midpoint (vs. connate only at base), the number of flowers per inflorescence (70 to 100 vs. 10 to 50), smaller fruits (5–7 mm vs. 7–10 mm diam.), and longer tomentum (1.5–1.7 mm vs. 0.6–0.7 mm). In addition, *R. umbellata*, occurring in Zhejiang, Taiwan, and Japan (Lu et al., 2003), is geographically distinct from *R. wuzhishanensis*. In conclusion, the morphological differences and the discontinuous distribution provide sufficient evidence for treating *R. wuzhishanensis* and *R. umbellata* as separate species.

*Conservation status and IUCN Red List category.* Our investigation shows that *Rhaphiolepis wuzhishanensis* is highly localized, known only from Mt. Wuzhishan, with no more than 1000 mature individuals in an area

of about 10 km<sup>2</sup>. We assess the conservation status as EN (Endangered) according to IUCN Red List criteria (IUCN, 2001). Fortunately, although it has a graceful figure and beautiful flowers, it has not yet been commercially exploited and introduced as garden plants, unlike *R. umbellata* and *R. indica*, because it is found in mountain forests above 1600 m, far away from villages. However, Mt. Wuzhishan is one of the most famous scenic spots in Hainan Island; therefore, the habitat of *R. wuzhishanensis* is more or less disturbed by tourists. Our investigation in Mt. Wuzhishan is still in progress, and it is anticipated that more plants and new sites for *R. wuzhishanensis* will be discovered. Moreover, study of the level of genetic diversity of the new species is currently under way in the laboratory using molecular markers. Detailed strategies will be suggested for the conservation and management of the species by these studies.

*Paratypes.* CHINA. **Hainan Island:** Mt. Wuzhishan, in mtn. forests, 1700 m, 30 July 2003, Q. Fan 2793 (SYS); Mt. Wuzhishan, near summit, 1820 m, 5 Aug. 2005, Q. Fan 6085 (IBSC, MO, SYS); Mt. Wuzhishan, in forests, 1780 m, 20 Jan. 2007, X. G. Shi 3142 (SYS).

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